Photochemical CO_2 reduction in water with a carbon nitride modified with Co porphyrin molecular catalyst

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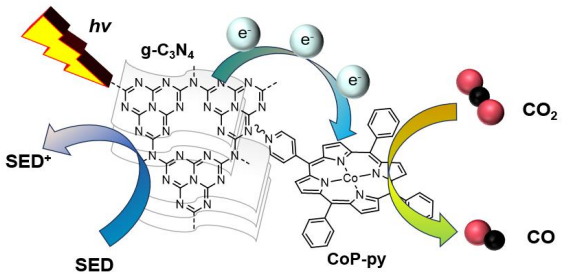
Recently, development of artificial photosynthetic systems, made up of a semiconductor photocatalyst and a functional molecule, promoting visible-light-driven CO_2 reduction reaction (CO_2RR) has received increasing attention. Among a large number of semiconductors, graphitic carbon nitride (g-C_3N_4) is often used as a semiconductor photocatalyst for CO_2RR because the conduction band edge potential possesses sufficiently negative potential for CO_2RR.[1] Nevertheless, a g-C_3N_4 photocatalyst modified with a molecular catalyst showing a high selectivity for CO_2 reduction even in a fully aqueous media is still very rare.

In this study, a g-C_3N_4 photocatalyst chemisorbed with Co porphyrin molecular catalyst having a pyridyl anchor[2] (g-C_3N_4/**CoP-py**) has been prepared and its performance for photocatalytic CO_2RR in the presence of a sacrificial electron doner (TEOA) has been evaluated in 0.1 M $NaHCO_3$ aqueous media saturated with CO_2. Under visible light irradiation conditions (λ > 400 nm), g-C_3N_4/**CoP-py** exhibits CO_2-to-CO conversion activity with a quite high CO production selectivity (about 80%, TON_{8h} = 3.4). This study revealed for the first time that our pyridyl anchoring technique is also effective for C_3N_4 and that higher selectivity is achieved by chemisorption of a relatively large amount of Co porphyrin promoting CO_2-to-CO conversion with a higher selectivity even in fully aqueous media[3].



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